



California Institute for Telecommunications and Information Technology
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April 2, 2004

Dr. Ghassem R. Asrar
Associate Administrator for Earth Science
National Aeronautics and Space Administration
NASA Headquarters Code Y
Washington DC, 20546

Dear Dr. Asrar:

The Earth System Science and Applications Advisory Committee (ESSAAC) held its 17th meeting at Scripps Institution of Oceanography on February 18-19, 2004. My principal goal for this meeting was to expose NASA, ESSAAC members, and ESSAAC's Earth Science Information Systems Subcommittee (ESISS) to recent successes in implementing grid technologies in other scientific disciplines, and thereby equip ESSAAC to better advise NASA on the evolution of its information infrastructure. Since these projects are typically funded by other Federal agencies or countries, there is a basis here for NASA to acquire technology more economically than if it had to be developed from scratch. I believe we succeeded. I am most grateful to our guest speakers, who invested precious time from their busy schedules to be with us physically or virtually.

The opening presentation you gave on the state of the Enterprise and on NASA's Exploration Vision provided the needed larger context for these discussions. Several members of the Committee emphasized the need for a new and compelling articulation of vision for Earth Science at NASA, in light of the new Presidential Directive regarding Exploration, and that information access and broad use in society must be a key feature of such a vision. I know this is a matter that you and many ESE staff are giving much thought. It will be the central discussion topic at the next ESSAAC meeting.

The series of presentations on the use of grid technologies in scientific programs delivered a wealth of information. From that vast wealth, the Committee harvested a few guiding principles that I will recount here. These and the other information presented should inform NASA's information infrastructure evolution planning.

- The successful implementations we saw were science driven; they understood the research goals to be accomplished, then sought information technology solutions.
- The diversity of the examples presented indicates there should be no real barriers for ESE implementing grid solutions to support its mission. With the EOS mission nearing completion with Aura, it is the right time to begin a strategic move to a next generation information infrastructure that encapsulates EOS as a legacy system. We must avoid limiting our future information systems by anchoring them to the successful, but last generation EOSDIS architecture.

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- Earth science presents unique challenges because of the dynamic nature of the Earth system, and because Earth science information has societal and commercial value. The data types, and thus the information product types are quite diverse. Standard database types may be inadequate for Earth science because they do not have good spatial representation. Yet these complicating factors are all part of "getting the science right".
- What is required is a coalition of early adopters who can show the way, sponsored through such means as ESE's REASoN program and ESTO's information technology program, resulting in several key successful Earth science information services.
- NASA may gain economy of scale in tough budget times by taking a "One NASA" approach to information infrastructure and creating a shared architecture across codes.
- In the same spirit, ESE should take advantage of the work being done outside NASA. NASA can gain by hooking up to the more advanced grid implementations now extant in other Federal agencies (NIH, NSF, DoE, DoD), Europe and Japan. ESE should take advantage of the convergence of "e-science" and "e-business" middleware so that Earth science can ride the wave of commercial investments in grid technologies, just as ESE is doing with high-end computing today.

The ESISS Chair, Dr. Bernard Minster, introduced a series of short presentations that summarized the work of ESISS immediately preceding our ESSAAC meeting. This included a very informative presentation by Ms. Vanessa Griffin of NASA characterizing EOSDIS users and usage. This was requested by ESSAAC at our last meeting. Our objective in so doing was to encourage NASA to learn from the usage of the current system, and it appears that we succeeded. The Committee was pleased with this presentation. The "lessons learned" identified in the presentation are valuable ones; it remains for NASA to incorporate them in its evolution planning.

Mr. Matt Schwaller presented an annotated outline of the Data and Information Management Plan that ESE is preparing to guide the evolution of data systems. In the course of his presentation, he described the comments received from ESISS. ESSAAC generally agrees with those comments. The fundamental principle behind the plan is the right one—balancing stability and innovation. The challenge is to be able to effectively infuse new technologies, approaches, and services into a production system. It is the difficulty of this challenge in an era of rapid technological change that makes writing the plan around functions and decadal roadmaps problematic. As Bernard Minster said, "rather than a roadmap, what we need is a good driver!" The plan should define a set of principles, and articulate a strategy for rapid prototype development, where prototypes live or die on their merits. The plan will also need to address the role of the private sector and a strategy for the effective use of commercial-off-the-shelf (COTS) software, which has its own set of advantages and challenges. Finally, ESE should consider adopting a new title for the document—one that reflects this approach (or at least has a more appealing acronym). ESISS will continue to assist NASA in structuring the document. ESSAAC looks forward to discussing a full draft in one of our next meetings.

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ESSAAC's Technology Subcommittee continues to work with the Earth Science Enterprise in its effort to define its investment portfolio in light of science priorities and the work of other government and university laboratories. The Subcommittee will review the Enterprise's approach to balancing these considerations in its next meeting. The Subcommittee is also reviewing the Enterprise's investments in laser technologies. Given the importance of laser remote sensing to the Enterprise's scientific endeavors, achieving a successful set of technology developments and partnerships in this area is critical.

ESSAAC discussed the letter received from the chair of the Global Energy and Water Cycle Experiment (GEWEX) Science Steering Group on extending the life of the Tropical Rainfall Measuring Mission (TRMM). TRMM has already operated well beyond its planned lifetime. The value of TRMM measurements has led to a desire for TRMM operations to be extended as long as possible, even to the point of overlap with the Global Precipitation Measurement mission. However, NASA is required to assure a safe de-orbit of TRMM given the size of pieces of the satellite that are expected to survive re-entry to reach the surface. This has led NASA to establish a target date to cease TRMM science operations. ESSAAC believes NASA is pursuing a responsible course of action given its safety responsibilities.

ESSAAC is prepared to assist ESE in the ongoing development of its Research, Applications, and Technology Plans. In the meeting, we identified several of our members who will review and comment on drafts of the Research Plan, and will work directly with Dr. Jack Kaye. The Technology Subcommittee will do the same for the Technology Plan. The Committee is mindful of the key interconnections between these subject areas. One of these is computational modeling and the requirements for high-end computing, and we urge ESE to ensure these are adequately covered in the Research and information plans. As we assist ESE in crafting these plans, ESSAAC should also highlight the possibilities for interagency cooperation, and how we can encourage such cooperation, as we discuss these and related science and infrastructure issues. In the tough budget environment now facing the Earth System Science (Geoscience) community, it is becoming more important than ever to develop cooperative, multi-agency programs to address our important science questions, as well as the infrastructure required for successful implementation.

We propose the following topics be included in the next ESSAAC meeting:

- Discussion of ESE vision in light of the President's announcement;
- What could Earth Sciences reach for with the new global grid infrastructure;
- (Re-titled) Data and Information Management Plan, including the approach to future prototyping efforts;
- ESE strategic plans for a next generation information infrastructure;
- ESE-wide investments in information technology;
- Science-driven priorities for computational modeling;
- Education program planning and progress (including information flow issues);
- Status of GEO/IWGEO activities.

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Finally, the Committee wishes to express its thanks to the ESE and Scripps staffs for their efforts to enable a successful meeting. I look forward to working with you as we prepare for our next meeting.

Cordially,

Larry Smarr
Chair,
Earth System Science and Applications Advisory Committee

cc: Dr. C. Kennel
Mr. G. Williams

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